Sepsis Care in the Air

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Survival Flight 14
Base Manager/Flight Nurse/Paramedic
What is Sepsis?

Sepsis was formally defined in a 1992 consensus statement by the ACCP/SCCM as systemic inflammatory response syndrome (SIRS) in the setting of infection.

The presence of bacteria (bacteremia), other infectious organisms, or toxins created by infectious organisms in the bloodstream with spread throughout the body (medicine.net)
Sepsis is fundamentally a systemic response to infection that results in organ dysfunction.

**Sequential [Sepsis-Related] Organ Failure Assessment (SOFA) Score**

<table>
<thead>
<tr>
<th>System</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration PaO2/FIO2, mmHg (kPa)</td>
<td>≥400 (53.3)</td>
<td>&lt;400 (53.3)</td>
<td>&lt;300 (40)</td>
<td>&lt;200 (26.7) with respiratory support</td>
<td>&lt;100 (13.3) with respiratory support</td>
</tr>
<tr>
<td>Coagulation Platelets, x10^3/μL</td>
<td>≥150</td>
<td>&lt;150</td>
<td>&lt;100</td>
<td>&lt;50</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Liver Billirubin, mg/dL (μmol/L)</td>
<td>&lt;1.2 (20)</td>
<td>1.2 - 1.9 (20 - 32)</td>
<td>2.0 - 5.9 (33 - 101)</td>
<td>6.0 - 11.9 (102 - 204)</td>
<td>≥12.0 (204)</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>MAP ≥70mmHg</td>
<td>MAP &lt;70mmHg</td>
<td>Dopamine &lt;5 or Dobutamine (any dose)</td>
<td>Dopamine 5.1 - 15 or Epinephrine ≥0.1 or Norepinephrine ≥0.1</td>
<td>Dopamine &gt;15 or Epinephrine &gt;0.1 or Norepinephrine ≥0.1</td>
</tr>
<tr>
<td>CNS GCS Score</td>
<td>15</td>
<td>13 - 14</td>
<td>10 -12</td>
<td>6 - 9</td>
<td>&lt;6</td>
</tr>
<tr>
<td>Renal</td>
<td>&lt;1.2 (110)</td>
<td>1.2 - 1.9 (110 - 170)</td>
<td>2.0 - 3.4 (171 - 299)</td>
<td>3.5 - 4.9 (300 - 440)</td>
<td>≥5.0 (440)</td>
</tr>
<tr>
<td>Creatinine, mg/dL (μmol/L)</td>
<td>Urine Output, mL/d</td>
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*Catecholamine Doses = µg/kg/min for at least 1 hr*
Hospital vs Prehospital differences in sepsis
The Society of Critical Care Medicine’s definition of sepsis contains thorough and sensitive tools to assist physicians with diagnosis. In most EMS systems the ability to draw labs or blood gases does not exist. However, there are several prehospital screening tools that aid in the decision making process for EMS providers so that early sepsis therapy can be initiated.

### Prehospital Sepsis Criteria

Two or more criteria met:
1. Temp <96.8 or >100.9
2. Heart rate >90 bpm
3. Respiratory rate >20
4. Acute altered mental status
5. Serum glucose >120

A suspected infection
- SBP <90 plus 2 of the following:
  1. HR >90 bpm
  2. Temp <96.8 or >100
  3. Respiratory rate >20
  4. Acute altered mental status
  5. Serum lactate >4 mmol/L AND EtCO2 of 25 or less

One or more criteria met:
1. SBP,90
2. RR > 30 breaths per min
3. Oxygen saturation <90

### Robson BAS 90-30-90 Sepsis Alert Protocol (COTS)
Prehospital Considerations and Sepsis

Vital signs and end tidal carbon dioxide (EtCO2) monitoring are used as key factors in the prehospital assessment of the septic patient.

Blood pressure/Heart rate

Respirations-Ventilation

Perfusion
Capnography is a very important tool for the prehospital clinician. It provides information about both ventilation and perfusion. As long as the body is working and metabolizing glucose and oxygen waste products will be eliminated into the bloodstream. Those wastes can only be released into the bloodstream if there is normal perfusion of the lung.

As perfusion decreases, EtO2 decreases along with it.

This results in an increase in metabolic waste in the bloodstream (lactic acid).

EtCO2 level is inversely proportional to lactate levels.

As we see lactate levels rise, we see EtCO2 levels drop.

EtCO2 readings < 25 mmHg in the clinical setting of shock are associated with increased mortality.

Patients with EtCO2 of 25 mmHg may have associated lactate levels of 6.1 mmol/L.
Prehospital Management

Prehospital caregivers focus primarily on fluid resuscitation and vasopressor infusions. The goal is to increase the patient's perfusion to vital organs.
Volume Status and Resuscitation

- As cytokine (proteins important in cell signaling) levels increase due to infection, the immune response creates massive vasodilation and a decrease in systemic vascular resistance. This creates hypotension in the septic patient.
- Prehospital goals are to get enough fluids in the vasculature to increase preload and increase blood pressure high enough to perfuse the body's vital organs. We are continually assessing level of consciousness.
- Septic shock is different than hypovolemic shock in that it does NOT need more oxygen carrying fluid.
- Isotonic fluids are adequate in the initial phases of treatment for increasing blood pressure in the septic patient.
Call for 30ml/kg crystalloid over first 3 hours of treatment

**Complications of this:**
- Fluid resuscitation should be based on ideal body weight
  - How are we figuring that out?
  - Over first 3 hours.....not the first 3 minutes
- pH of normal saline is 5.5
  - How do you think this affects a person who is septic?
  - Think about acidosis......
In general, EMS will administer 500 ml bolus NS as tolerated until SBP>90 or MAP>65.

MAP = \frac{2(DBP)+SBP}{3}

MAP offers a better representation of overall perfusion to the vital organs of the body.
Vasopressor

Preferred pressor is Norepinephrine (Levophed)

Primarily Alpha Stimulation (Squeeze)
Some Beta 1 (Heart rate/Contractility)

Dose range:
1-30mcg/min
(Some protocols may be weight based)
Other Vasopressor Medications

• **Epinephrine gtt:** 2 to 10 mcg/min inopressor (alpha and beta 1 and 2)

• Push Dose Epi until gtt is mixed. Note that epinephrine will cause a rise in serum lactate levels

• **Dopamine:** (Is anyone still using this?) 5 to 20 mcg/kg/min. Often times these patients are already tachycardic and therefore dopamine is omitted.

• **Dobutamine** 5-20 mcg/kg/min for aid in contractility.

• **Vasopressin:** 0.04-0.12 units/hr

• **Neosynephrine:** pure alpha 50 to 200 mcg/mg initially
• Airway and Breathing

Maintain SpO₂ of 94-99%
Follow your protocol! If you have to intubate via RSI consider avoiding etomidate. Etomidate suppresses corticosteroid production. Our patients need corticosteroids to heal and recover from their illness.
IF EMS has capability to monitor serial serum lactate levels via fingerstick this can be useful to ED staff. Even if an initial fingerstick lactate can be acquired, it is helpful for the ED to have as a baseline prior to fluid resuscitation.
HOW CAN WE HELP OUR PATIENTS THE MOST???

• Proper assessment
• Be proactive
• Be aggressive

Call a SEPSIS ALERT to the hospital!
Why call a SEPSIS ALERT?

• To help initiate prompt antibiotic treatment!!!
Interfacility transports and septic shock

- Continue the treatment started at the referring facility
- Follow our company's protocol
- Ensure the patient continues to perfuse and ventilate properly with adequate blood pressures and minute volumes
What makes a patient septic?

(Labs help us identify these patients at risk)

Patient meets SIRS criteria in the presence of possible infection.

**SIRS Criteria**

- Temperature $>38^\circ$ C (100.4$^\circ$ F) or $<36^\circ$ C (96.8$^\circ$ F)
- Heart rate $>90$
- Respiratory rate $>20$ or PaCO$_2$ $<32$ mm Hg
- WBC $>12,000$/mm$^3$ or $<4,000$/mm$^3$ or $>10\%$ bands
<table>
<thead>
<tr>
<th>Hospital Sepsis Criteria</th>
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<tr>
<td><strong>Sepsis</strong></td>
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<tr>
<td>≥2 SIRS criteria + known or suspected infection</td>
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<tr>
<td><strong>Severe Sepsis</strong></td>
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<tr>
<td>Sepsis AND</td>
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<tr>
<td>At least 1 sign of organ dysfunction:</td>
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<tr>
<td>- Sepsis-induced hypotension</td>
</tr>
<tr>
<td>- SBP &lt;90</td>
</tr>
<tr>
<td>- MAP &lt;65</td>
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<tr>
<td>- ↓ SBP &gt;40 from normal baseline</td>
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<tr>
<td>- Cr &gt;2.0 or urine output &lt;0.5 mL/kg/hr x2 hours</td>
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<td>- Bilirubin &gt;2.0 mg/dL</td>
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<tr>
<td>- Platelet count &lt;100,000/mm³</td>
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<tr>
<td>- INR &gt;1.5 or PTT &gt;60 sec</td>
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<tr>
<td>- Lactate &gt;2 mmol/L</td>
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<tr>
<td><strong>Septic Shock</strong></td>
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<tr>
<td>Severe sepsis AND</td>
</tr>
<tr>
<td>- Persistent hypotension after 30 mL/kg crystalloid</td>
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<tr>
<td>- Lactate ≥4 mmol/L</td>
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Getting Report: Why do they ask these questions???

Is the source of infection known?
Did you already draw blood cultures?
Have antibiotics been given?
Allergies?

How much fluid has the patient received?
How has their blood pressure and heart rate been trending?

What was the patient's WBC, electrolytes, creatinine, and lactic acid?
Do we have an ABG?
What are those results?
Do we have any relative Ct results?

What initially brought the patient to the hospital? Does the patient have significant medical history?
• **M** = Mechanism- What was the cause of the injury or illness
• **I** = Injury or Illness- What is the injury sustained or illness found? What injury/illness did you suspect?
• **S** = Signs and Symptoms- What physical signs of injury or illness is the patient displaying? What are the symptoms the patient describes to you?
• **T** = Treatment- What treatments have been administered? What medical care did you provide up until the handover to the ED/ICU?
• You may hear this referred to as DMIST were the **D** = Detail- What is the patients chief complaint, what is their age, medical history, allergies etc.
Survival Flight Ohio
Survival Flight 14 - Grove City
Survival Flight 13 - Westerville